

REMARKS

Reconsideration of the above referenced application, as amended, is respectfully requested.

Restriction Requirement

Claims 1-3, 18-26, 31, 37-45 52-71 and 75-77 have been presented for examination. Restriction has been required for Group I, claims 1-3, 18-26, 31, 37-45 52-70, drawn to a catalyst and methods for its preparation, classified in Class 502, Subclass 527.12; and Group II, claims 71 and 75-77, drawn to an engine comprising an exhaust system classified in Class 123, Subclass 25 R.

Initially, the applicant provisionally elects to prosecute Group I, claims 1-3, 18-26, 31, 37-45 52-70, with traverse.

In making the restriction requirement, it is asserted that the inventions are distinct from each other because Groups I and II are unrelated. The inventions are asserted to be unrelated if it can be shown that they are not disclosed as capable of use together and have different modes of operation, different functions, or different effects. In the instant case, it is asserted that the different inventions have different functions. Invention I is has the function of being a sorbent or catalyst composition. Invention II is direct an engine comprising an exhaust system.

Reconsideration of this basis of restriction is requested. 35 USC § 121 permits restrictions if two or more independent and distinct inventions are claimed in one application. It is only asserted that the inventions are distinct from each other. There is no assertion that the inventions of the claims of Groups I and II are independent. The claims of Group I relate to a specific catalyst. The claims of Group II relate to an engine comprising an exhaust system using the catalyst from Group I. Accordingly, the claims have a certain commonality and cannot be asserted to be independent.

For the above reasons, withdrawal of the restriction requirement is respectfully requested.

Amendment

Independent claims 1, 18, 45 and 71 have been amended to include the phrase "with each strata being up to 20 micrometers in thickness". Basis for this phrase is in the specification at page, lines 22-25. Claim 71 has been amended in the event that the restriction requirement is reconsidered.

Claims 22-25, have been amended to change dependency.

Table 1, at page 59 is part of Example 3 and has been corrected to make minor formatting changes and to correct the labeling to be consistent with Example 3. P4 was changed to P1 and P6 was changed to P2 to correspond to the Plate designation in the text of Example 3. Additionally, columns were changed for better alignment. NO<sub>x</sub> was changed to NO<sub>x</sub>.

The Rejection 35 USC § 103(a)

Claims 1-3, 18-26, 31, 37-45 and 52-70 have been rejected under 35 USC § 103(a) as being unpatentable over U.S. Patent No. 5,597,771 to Hu, et al. (Hu).

Hu is cited as disclosing a catalyst composite having first and second layers. The first layer comprises at least one first palladium component and an oxygen storage component in intimate contact with the one first palladium component, optionally a first platinum group metal component, a zirconium component and alkaline earth metal component and at least one first rare earth metal component selected from lanthana and neodymium metal components. The second layer comprises at least another second palladium group metal component, optionally another second platinum group metal component, at least one second alkaline earth metal component, at least one second rare earth metal

component selected from lanthana and neodymium metal components, and a zirconium component. Reference is made to various citations from the Hu patent regarding various components. Reference is made to Hu et al. at col. 8, lines 18-48.

Hu is cited as disclosing oxygen storage components and platinum group metals at col. 8, line 58 to col. 9, line 37; alkaline earth metals at col. 10, lines 16-24.

Hu is cited as disclosing that a catalyst composite can be coated inlayers on a monolithic substrate, preferably a metal or ceramic honeycomb carrier at col. 16, lines 40-45 and col. 17, lines 50-53, as well as col. 17, line 66 to col. 18, line 51.

Hu is cited as disclosing that the layers can be in the form of particles having a size of less than about 20 microns (first layer), and less than 25 microns (second layer). See col. 20, lines 22-36 and col. 21, lines 11-27 of Hu.

Hu is further cited as disclosing that the catalyst composite is useful to promote chemical reactions, especially the oxidation of carbonaceous materials, e.g., hydrocarbons, said reactions conducted at temperatures ranging from at least about 100°C, typically about 150°C to 900°C, and generally with the feedstock in the vapor phase.

The Examiner observes that the difference between the Hu reference and the instant claims is that Hu does not specifically recite the claimed components, e.g., a "precious metal component".

The Examiner concludes that, Hu teaches catalyst components (as well as the substrate/support components) that read on the claims in their present form. Therefore, it is concluded that it would have been obvious to one skilled in the art to select any of the components in the cited references, since it has been held to be within the general skill of a worker in the art to select a material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 U.S.P.Q. 416.

### The Presently Claimed Invention

The present invention is presented in claims 1-3, 18-26, 31, 37-45 and 52-70. The claim will be understood by reference to recitations in the specification of definitions of various terms appearing in the claims. For convenience some of the definitions follow. The definitions are expanded in the specifications section, Detailed Description of the Preferred Embodiments.

**"substrate surface"** (p.8, lines 10-22) - "the term substrate surface is considered to be the surface of the metal substrate and can include a thin layer which can be up to 10 micrometers thick or more which is derived from metal within the metal substrate which diffuses to the surface, or from metal which is plated or clad onto the surface. The metal of the substrate surface is preferably in a continuous layer up to about 5 micrometers thick and is preferably selected from aluminum and rare earth metals. The substrate surface metal can be oxidized by calcining in the presence of oxygen in a temperature range of from about 800° to about 1200°C. Preferably the substrate surface comprises alumina in a continuous layer ranging up to 5 micrometers and more preferably 3 micrometers in thickness."

The substrate surface metal can be oxidized by calcining in the presence of oxygen in a temperature range of from about 800° to about 1200°C. Preferably the substrate surface comprises alumina in a continuous layer ranging up to 5 micrometers and more preferably 3 micrometers in thickness. The alumina substrate surface enhances adhesion to catalyst compositions which may be deposited thereon. The presence of rare earth oxides enhances the thermal stability at the substrate surface. (p.8, lines 22-26)

**"catalytically active particulate matter"** (p.8, lines 31-33) -  
"The catalytically active particulate material can be any suitable particulate material and is preferably a refractory oxide compound used to support a catalytically active precious metal component."

**"strata"** (p.8, lines 34-37) - "The catalyst layer preferably comprises at least two and more preferably a plurality of strata. That is each catalyst layer is formed by a plurality of thin catalyst composition coatings."

"A stratum of a refractory compound, such as alumina or catalyst compound containing a refractory support such as alumina, is sprayed on in a layer up to about 20 micrometers in thickness." (p. 49, lines 22-25)

Multiple layers (i.e., strata) of the same or different compositions within the scope of the present invention can be applied and advantage taken of the use of the different diameter supports and segregation and distribution of materials within each separate layer. (p. 8, lines 34-36, p.32, lines 25-35)

**"agglomerates"** (p.8, line 37 to p.9 line 3) - "There is an outer catalyst layer surface which comprises agglomerates of the catalytically active particulate material. The agglomerates of the outer catalyst layer preferably have an average diameter of from about 20 to about 200 micrometers."

**"peaks"** (p.9 lines 3-8) "At the outer surface, particularly when the catalyst composition is sprayed from an aqueous slurry, the agglomerates adhere to each other to form peaks. Typically and preferably, the peaks range from about 20 to about 500 micrometers. This forms a rough surface which enhances mass transfer from the gas into the catalyst layer."

"**tie layer**" (p.9, lines 30-36) - "In a more specific and preferred embodiment the article comprises the above recited metal substrate having a substrate surface comprising alumina, and a tie layer comprising a refractory metal component adjacent to the substrate surface. Preferred tie layer refractory metal components, can be compounds derived from at least one of aluminum, titanium, silicon, zirconium and/or cerium compounds. There is a catalyst comprising at least one catalyst layer supported on the substrate surface with a tie layer being between the substrate surface and the catalyst."

The present invention is claimed in claims 1-3, 18-26, 31, 37-45 and 52-70. Claims 1-3 and 52-70 are directed to an article; claims 18-26, 31, 37-44 are directed to the method of making; and claim 45 to is directed to a method of use. These claims include various combinations of elements including one or more of those defined above.

The advantages of the present invention are reviewed in the specification and illustrated in the Examples. Reference is particularly made to the specification at pages 12, line 26 to page 15, line 5, and the Examples beginning at page 53, beginning at line 7. A significant advantage is the adherence of a catalytic layer to a metal substrate surface. This is particularly useful for treatment of gases such as carbon monoxide and hydrocarbons which are oxidized at the catalytic surface which results in an exotherm at the surface. The agglomerating structure forms a surface which has increased surface area for increased mass transfer from a gas stream. This is especially effective when the catalyst is sprayed on to a metal plate which may be exposed to turbulent gases as opposed to the laminar flow through the channels of a honeycomb substrate.

## Discussion

As indicated above, claims 1-3, 18-26, 31, 37-45 and 52-70 were all rejected under 35 USC § 103(a) based on the disclosure of Hu. For the reasons that follow the claims of the present application are not disclosed or suggested in Hu.

The present invention is directed to the claimed articles and methods which include a combination of elements including the catalyst and one or more additional elements. Significant elements include the substrate surface, strata, agglomerates, peaks, regions and tie layer. Additional elements in various claims include the metal substrate, a rough substrate surface, specific embodiments of the catalyst composition, specific catalyst layers, and specific features relating to the metal plate.

While Hu discloses specific catalyst compositions and a catalyst composite, Hu does not suggest or disclose the presently claimed articles or methods. In particular, Hu does not disclose or suggest the presently claimed combination of elements wherein each of the present claims includes a catalyst and at least one of the elements referred to above. As indicated above, applicants have found that the structure of such articles and related methods of making and using such articles result in the advantages recited in the specification as referenced above and illustrated in the Examples. Following is a discussion distinguishing the various claimed embodiments.

### Claims 1-3 and 52-70 are directed to an article.

There is no disclosure or suggestion in Hu of claim 1 elements which are that, "the outer catalyst layer surface comprises agglomerates of the catalytically active particulate material having an average diameter of from about 20 to about 200 micrometers, and wherein the agglomerates at the outer catalyst layer surface adhere to each other to form peaks from about 20 to about 500 micrometers". Nor

is there disclosure that the outer surface is, "formed by depositing of at least two strata of the catalytically active particulate material with each strata being up to 20 micrometers in thickness".

Hu is cited at col. 8, lines 18-48 as disclosing a two layer catalyst composite. However, there is no disclosure of the specific catalyst and metal substrate combination as recited in claim 1 and the claims depending therefrom. Reference is also made to col. 20 lines 22-36 and col. 21, lines 11-27 to support the assertion that that, "the layers can be in the form or particles having a size of less than about 20 microns (first layer) and of less than 25 microns (second layer)." (sic) (O.A. page 6, lines 1-3) While the first and second layers can contain particles less than 20 microns, there is no disclosure that the layers are formed of strata "with each strata being up to 20 micrometers in thickness". Nor is there any disclosure or suggestion that "the outer catalyst layer surface comprises agglomerates of the catalytically active particulate material having an average diameter of from about 20 to about 200 micrometers, and wherein the agglomerates at the outer catalyst layer surface adhere to each other to form peaks from about 20 to about 500 micrometers formed by depositing of at least two strata of the catalytically active particulate material" as presently claimed. In accordance with the present claims the outer catalyst layer surface is formed by the depositing of at least two strata with each strata being up to 20 micrometers in thickness. This is not disclosed or suggested in Hu. Hu discloses the application of layers by any suitable method with specific embodiments including dipping. See, for example, Hu at col. 17, 36-49 and the Examples. Hu does not the presently claimed article having the outer catalyst layer surface as claimed.

Claims 2, 3, 52-61 are directed to specific embodiments of catalysts which are useful in combination with claimed "the outer catalyst layer surface". Such a combination is not disclosed or suggested in Hu.



None of claims 1-3, 52-61 are disclosed or suggested in the cited passages in columns 8 - 10 of Hu.

Claims 62-65 are directed to specific embodiments of the metal substrate in the form of a metal plate which are claimed in combination of the elements of the claim 1. Various passages of Hu are recited from columns 16-18. However, the combination of elements, particularly those recited above with regard to claim 1, is not disclosed or suggested in Hu.

Claims 66-70 are directed to an article "wherein the metal substrate is in the form of at least part of an exhaust system wall defining an exhaust stream passage". Neither these elements, nor a combination of these elements with the elements of the claims from which they depend, are disclosed or suggested in Hu.

Claims 18-26, 31 and 37-44 are directed to the method of making.

Claims 18 and 19-26, 31 and 37-44 are directed to a method comprising the steps of "depositing at least two strata of a catalyst on a substrate surface of a substrate to form a catalyst layer with each strata being up to 20 micrometers in thickness... .. to form agglomerates of the catalytically active particulate material having an average diameter of from about 20 to about 200 micrometers and wherein the agglomerates at the outer catalyst layer surface adhere to each other to form peaks from about 20 to about 500 micrometers." This method is not disclosed or suggested in Hu.

As recited above, there is no disclosure or suggestion in Hu of claim 1 elements which are that, "the outer catalyst layer surface comprises agglomerates of the catalytically active particulate material having an average diameter of from about 20 to about 200 micrometers, and wherein the agglomerates at the outer catalyst layer surface adhere to each other to form peaks from about 20 to about 500

micrometers". Nor is there disclosure that the outer surface is, "formed by depositing of at least two strata of the catalytically active particulate material with each strata being up to 20 micrometers in thickness". Reference is made to the above discussion distinguishing claim 1 from the disclosure in Hu. This is not disclosed or suggested in Hu. Hu discloses the application of layers by any suitable method with specific embodiments including dipping. See, for example, Hu at col. 17, 36-49 and the Examples. Hu does not the presently claimed of forming a catalyst layer comprising the step of depositing two strata. (claim 18 and all of the claims depending thereon)

There is no disclosure or suggestion in Hu wherein the step of depositing each stratum comprises spraying the slurry. (claim 22)

There is no disclosure or suggestion in Hu wherein the strata of the layer comprise different catalyst compositions. (claim 25)

Additionally, Hu does not disclose or suggest embodiments of claim 31, 37, 38 and 39 taken with the elements of the claims from which they depend.

Claims 45 is directed to the method of the article of claim 1.

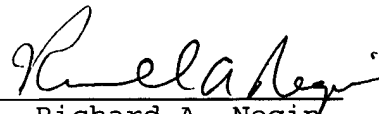
Reference is made to the above Remarks relating to claim 1.

Therefore, withdrawal of the rejection of claims 1-3, 18-26, 31, 37-45 52-70 under 35 USC § 103(a) in view of Hu is respectfully requested.

For the above reasons, entry of the proposed amendments, withdrawal of the restriction requirement, 35 USC § 103(a) and allowance of claims -3, 18-26, 31, 37-45 52-70 is respectfully requested.

The applicant believes that this application is now in condition for allowance of all claims therein, and such action is respectfully requested. If the Examiner disagrees or believes that for any other reason direct contact with applicant's attorney would advance the prosecution of this application to finality, the Examiner is invited to telephone the undersigned at the number given below.

Respectfully Submitted,

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